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THE FRANKLINIC INTERRUPTED CURRENT

OR, MY NEW SYSTEM OF THERAPEUTIC ADMINISTRATION OF STATIC ELECTRICITY

BY

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THE FRANKLINIC INTERRUPTED CURRENT;

OR, MY NEW SYSTEM OF THERAPEUTIC ADMINISTRATION OF STATIC ELECTRICITY.[1]

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THE object of this paper is to lay before the profession more explicitly the writer's new system of treatment of disease by Franklinic or static electricity. The old system by sparks and other forms of the disruptive discharge upon the person is already sufficiently familiar. What I here designate as my new system has developed itself to me gradually during the last ten years. Parts of it I have published, other parts not. Granting and acting upon that moral dictum which forbids the physician from patenting his inventions and discoveries, I may remark in passing, as illustrative of the disadvantages under which

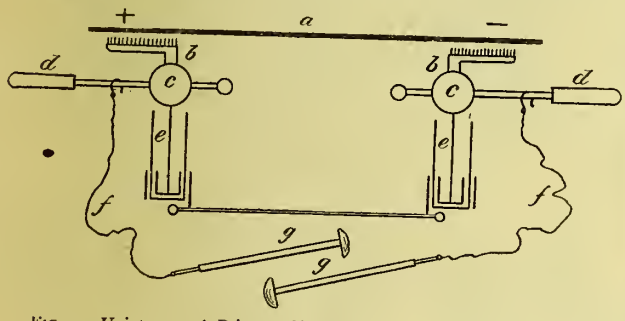

FIG. 1.—Uninterrupted Primary Circuit of a Holtz Machine, with or without Condensers. *a*, Rotating plate; *b*, *b*, collecting combs; *c*, *c*, prime conductors; *d*, *d*, discharging rods; *e*, *e*, Leyden jars; *f*, *f*, conducting cords; *g*, *g*, sponge or other electrodes. Upon grasping the two electrodes and setting the machine in motion no current is felt and no action on nerve and muscle perceived.

he is placed thereby, that some makers of Holtz machines are now generally attaching my inventions to their machines and adopting my methods without the slightest credit, while one even has gone so far as to take out patents for the very things I had published widely. The demands which are daily made upon electro-therapeutics in general and its brilliant extension into the domain of gynecology induces me to now present the facts in their entirety, in order that they may take their share, according to their merits, in the universal progress.

Up to the time of the writer's first apparatus in 1880, and first publication in 1881, concerning "a new induction current in medical electricity,"[2] static electricity had been applied medically by administering a spark, or some modification of it, direct to the person of the patient, or by giving in the same direct manner a single shock from a Leyden jar. From the earliest medical electrifications by the Abbé Nollet, in 1734, onward and successively through the revivals of the practice by Golding Bird, Sir William W. Gull, and Wilks, of Guy's Hospital, London, in 1837, 1851, and 1873; by Schwanda and Clemmens respectively in Austria and Germany; by Vigoroux and Charcot, in Paris in 1879, and by myself in America in 1880, we become familiar with breeze, spray, sparks, and shock, but no mention is made of current disassociated from the spark delivered to the person, nor prior to my own had any electrodes been shown by which a current, except in spark form, could be developed from a Holtz or other influence machine. When, in general, nerve and muscle reactions were spoken and written of, reference was had to galvanic and to faradic currents from coils and voltaic cells, or from coils and magnets, but not to any current derivable from frictional electricity. The spark and static electricity had become synonymous terms. That no one during more than one hundred and fifty years should have sought out the kinetic or current feature of the static discharge (in other than spark form) and harnessed it to an electrode capable of bringing it into use, seems most remarkable—the more so since my kinetic form produces a far greater and more powerful nerve and muscle stimulation per second than the spark form, and if discovered before the days of the secondary coil would at once have brought the frictional machine into the front rank of current administrations.

My new system, published and unpublished, comprises the development by an influence machine of a rapidly interrupted and graduated current, by means of a circuit breaker, introduced into a circuit with and without condensers, and in the medical applications of this current without and within the human body by moistened sponge or other electrodes, just as in the case of the ordinary galvanic and faradic currents.

It involves the removal of the spark, in itself more or less disagreeable and painful and often difficult to localize, especially about the face and neck, away from the patient's body, and yet retaining all the physiological effects of the kinetic or current part of the circuit. The spark is no longer a direct feature of the administration; it occurs at some distant part of the necessarily closed circuit, and in modified form now becomes mainly a reg-

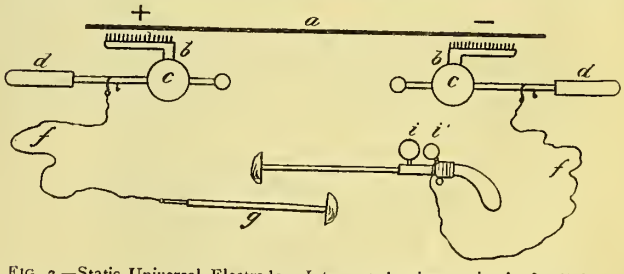

FIG. 2.—Static Universal Electrode. Interrupted primary circuit of a Holtz Machine, without condensers. Parts lettered same as in Fig. 1. *i*, *i*, Static universal electrode in circuit. Upon grasping the two electrodes and drawing the two brass balls *i*, *i*, of the circuit-breaking electrode apart a current is felt causing vigorous muscular contractions in ratio with the distance apart of the balls *i*, *i*, and as long as sparks will pass between them, in contradistinction to no reaction produced in Fig. 1. Patient insulated. Method applicable to small machines. With large machines method illustrated in Fig. 4 is recommended.

ulator for timing the discharge of the equalizing potentials.

The circuit-breaker is a pair of adjustable metallic balls electrodes, introduced at any point of the circuit, having a narrow air space between the balls; the circuit "makes" when a small spark overcomes the resistance of the intervening air, and "breaks" when it fails to do so, and the current is due to rapidly successive equalizations of the differences of potential of oppositely charged condensers, whether prime conductors or with the addition of Leyden jars. The circuit-breaker serves:

1. To afford time (infinitely brief) to the prime conductors and condensers, if used, to charge.

[1] Read before the New York Neurological Society, Dec. 2, 1890.
[2] Read before the New York Academy of Medicine, March 2, 1881.

laterally the frequency of the succession of transient currents, so that their aggregate may be classed as a steady current.

3. To determine the strength of the current. This latter may be varied at will and with the utmost nicety, from a just perceptible to a most powerful effect.

The spark circuit-breaker now practically represents the vibrator in the primary of an induction coil; the

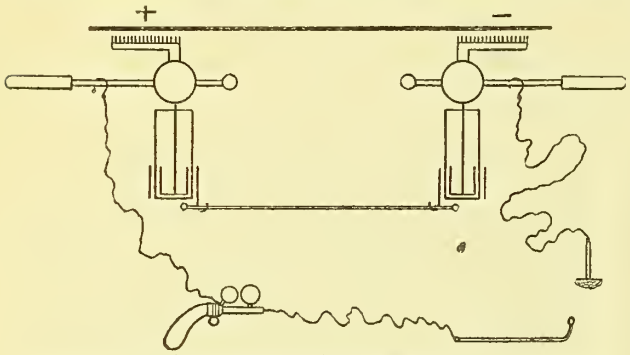

Fig. 3.—Static Universal Electrode, with Condensers. Otherwise same as Fig. 2, but current more powerful. Small condenser preferable.

specific inductive capacity of the air replacing the spring and its magnetic attractability and I use it as in that example and in the same relations, *i.e.*, to interrupt the primary current or by reason of an interrupted primary to obtain a secondary current.

I thus put the use of static electricity on a comparable basis with the other two forms of electricity, the galvanic and the faradic; in short, it becomes kinetic, flowing or current electricity. For just as the infinitely rapid suc-

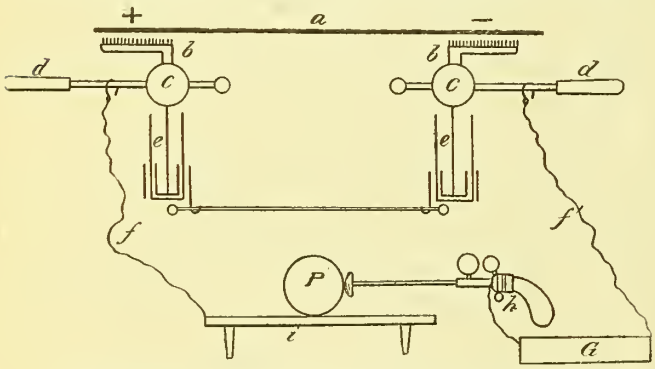

Fig. 4.—Static Universal Electrode. In primary circuit grounded. Patient condensers, and circuit-breaker in same circuit. Patient on an insulated platform as in giving sparks. *f, f.* Grounded pole of machine and connection to platform; *P*, person insulated; *G*, grounded chain from universal electrode, having curved handle, to be held by administrator and applied upon the person of the insulated subject, strength of current graduated by the finger and adjustable balls of circuit breaker. (See Figs. 6 to 14.)

cessive chemical action in a voltaic cell sets up a similarly rapid successive propelling electro-motive force, termed in its aggregate in a closed circuit a "steady" current, so in this new form, by parity of reasoning, the constantly accumulating potentials, regulated by the sparking circuit-breaker in a remote part of the circuit, discharge with sufficient rapidity to also justify the application "steady" to that succession of impulses, any one of which in its single form is termed a transient current. The current of the induction coil offers a still better parallel. It is a rapid succession of electric impulses, each transient by itself, but taken as a whole steady, and sufficient to maintain a continuous muscular contraction or other effect. Accepting the fact that the rapidity of succession of impulses of the new current is in itself sufficient to produce a steady current, we may now go a step further and say that each impulse in itself consists of a vast number and range of oscillations or alternations (of one hundred millions, for instance, per second), and, putting all the facts together, we may doubtless willingly concede that a current whose physical properties so positively differ from other currents must possess equally positive and differing physiological properties. But we will refer again to these properties later on.

It is too much the custom in medical text-books to make an arbitrary distinction between statical and dynamical electricity. Such a hard and fast line of demarcation in electro-therapeutics is misleading. Medically, in static or any other form of electricity, we have nothing to do with the electro-statical phenomena, viz., with stresses and strains set up in insulating, or rather dielectric media. The only thing we have to deal with is current, *i.e.*, electricity propelled along conductors by electrolytic or metallic conduction. The most modern views of electricity are, that what we call electricity is a specialized form of vibration

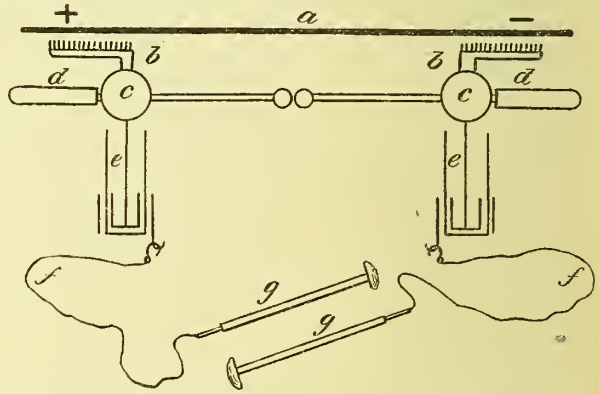

Fig. 5.—"Static Induced Current." Parts of Static Universal Electrode Separated. Person, condenser, and circuit-breaker in same circuit, connecting-rod between condensers removed, and discharging-rods of machine serving as circuit-breaker; but the circuit-breaker is in the primary circuit, and the person in the secondary. The make and break in the primary is accompanied with a current in the secondary.

of the ether which pervades all space and matter. The vibrating ether may be entangled in certain kinds of matter (insulators or dielectrics) and we then have a displacement or strain of this substance (electro-statics), or the dielectric may dissipate its strain in certain other kinds of matter called conductors, and we then have current (electro-kinetics). In franklinization, the stress, strain, or charge is only a condition precedent to the breaking down of the strain (spark) by a rupture of the dielectric (air) and its dissipation along the most convenient conductor (the human body). It is to the current, then, of a statical electrification that we look for a therapeutic effect, not to the electrification itself, and this current we get in a momentary form at every discharge of the electrification, or in steady form, in my own system, of a very rapid succession of momentary impulses, determined by the spark circuit-breaker. The simple charge of a Leyden jar will illustrate our point. For it practically includes the entire domain of electricity; the charge of the jar includes electro-statics or electricity at rest, or electricity in strain; its discharge, electro-kinetics, or current electricity, or electricity with the strain dissipated. Medically we use the discharge (spark, current), a point strangely lost sight of by some writers, who, confused by the term static, claim that the treatment is static, *i.e.*, a surface charge, *i.e.*, superficial, and that no effect therefore can be produced beneath the surface. It is time now

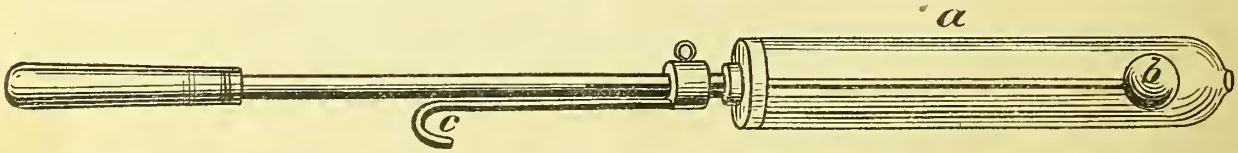

Fig. 6.—Internal Administration of Sparks. *b*, Electrode; *a*, insulating tube perforated for passage of spark and currents; *c*, guiding handle for regulating length of spark and currents.

that this delusion should be dropped and the fact be frankly admitted that electro-statics in practice will give the physician a current that will demonstrably penetrate the human tissues as deeply as it can be demonstrated that any other current will penetrate them.

FIG. 7.—Method of Application of the Static Induced Current. One electrode applied to sterno-cleido-mastoid muscle for illustration.

In practice, the electrical principles involved may be carried out by two main methods.

1. By including the circuit-breaker and patient in the primary circuit, with or without condensers. Fig. 2 (without condensers), Fig. 3 (with condensers), Fig. 4 (patient insulated), and circuit grounded (best method for external administrations), and

2. By including the circuit-breaker in one circuit and the patient in another, viz., in an induced or secondary circuit (Fig 5).

In both methods sponge and metallic electrodes are used externally or internally, as in ordinary galvanic or faradic treatments. For the former, I have invented a special electrode, for the latter I use the 1880 combination of the parts of the machine as a circuit-breaker.

As I have pointed out in a recent article[1] the spa[illegible] not to be regarded by itself and as a mere mechanical and superficial phenomenon like the blow of a light hammer, but as the air part of the closed circuit, whose remaining parts within the body (and in the connections and machine) evoke the well-known nerve and muscle reactions. But effective as this spark direct to the skin is, it has, as might be expected, its quota of disadvantages, among which may be mentioned, the relatively small number of spark currents provokable in a given time by a ball electrode, the more or less painful feeling in the skin, the possible humidity of the air, or of the patient's person, the difficulty of localizing it about the face and neck,

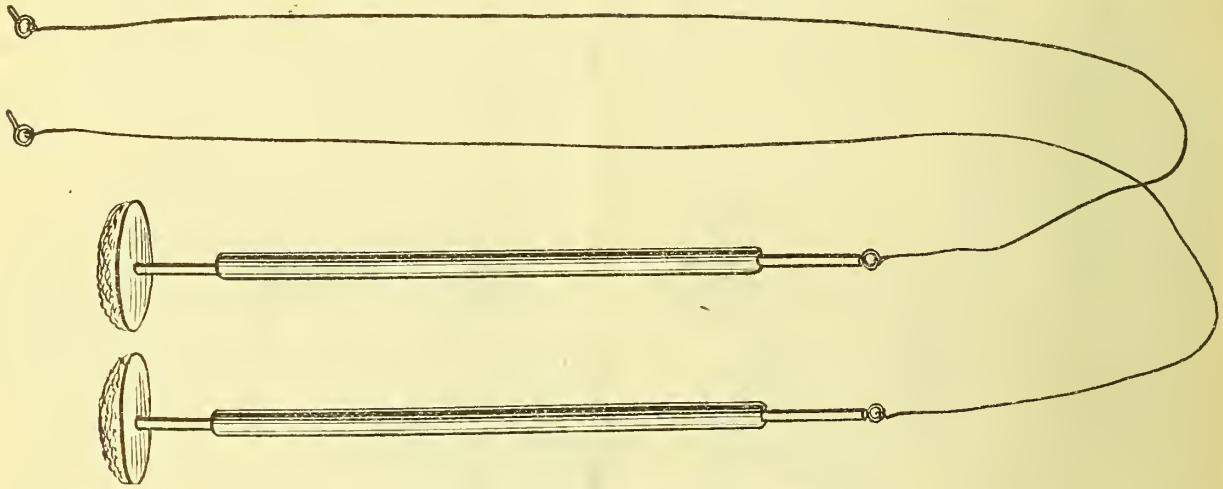

FIG. 8.—Handles for Static Induced and great variety of Terminal Electrodes.

and finally, and most important, the comparative difficulty of using it at all for throat, uterine, and other internal treatment. For these reasons I supplement the usefulness of the Holtz machine and its usual spark administration, and have devised and formulated the present system. Its fundamental principle, as has been pointed out, is that of interrupting the circuit at a point remote from the patient, while still including him in the circuit. And although the static induced current was published, a most useful and important element in the system, and one embodying in itself, in a simple and practical manner, all the principles involved, viz., the statical universal electrode, has only appeared in the catalogues of instrument makers, while concerning the internal use of the franklinic current nothing has been said. It seems therefore advisable now to collect the scattered data and present the system as a whole and as constituting a new system, particularly since no attempt has before been made to formulate the details of mechanical arrangement under one general statement, nor to differentiate the nature of the current and its physiological effects, beyond the general and, in the opinion of the writer, most superficial comparison of the current to the faradic.

The illustrations in this article will serve to indicate the principal connections referred to.

A current may also be obtained by attaching one cord to one prime conductor (with condensers) and the other to the outer coating of the condenser on the other prime conductor, but it is harsh and lacks the good qualities represented by connections as in Fig. 5.

Fig. 1 is shown merely for illustration. There being no circuit-breaker there is no perceptible current. Figs. 2 and 3, though representing perfectly practical connections, especially with small machines, are best replaced in practice and with large machines by Fig. 4.

Fig. 4 represents a working method hitherto undescribed, except by cuts in the manufacturers' catalogues (as early as 1881), embodying, in the simplest and most practical manner, the fundamental principle of my new system, viz., the interruption of the circuit at a point removed from the patient.

Figs. 5 and 7 represent the secondary current, termed by me the "static induced current," elsewhere referred to. On the whole I give my preference in most forms of treatment to the connections represented by this figure. It will be readily seen that any kind of electrode may be readily attached to the terminals.

Maintaining as I do in practice a continuous action of the machine by water-power, I often find it desirable while making a change in the position of an electrode, Fig. 4, to shut off the electricity without stopping the machine. This I do by simply short circuiting the prime conductors. This procedure obviates the slight spark which inevitably ensues on approaching the electrode to its position, unless this is done while the machine is at rest.

Though here not in line with the exact subject-matter of this paper, I furnish an illustration of an electrode (Fig. 6) made in a variety of sizes and forms, by aid of which sparks may be administered to the cavities of the body. Though long in use by myself a description of it has not before been generally published. Its applications are manifest, and its modifications manifold, according as it

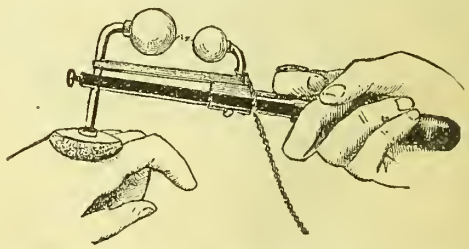

FIG. 9 represents this electrode as constructed in 1880; arranged for a moistened sponge or other terminal. The two adjustable brass balls constitute the circuit-breaker, the spark passes between the two and a corresponding current produces characteristic electric reactions at the point of application of the sponge to the body.

is desired to apply a spark along the urethral canal, to the uterus, throat, or other internal cavity. It may also be used to exactly localize the sparks upon the exterior of the body.

Static Induced Current.—For this current the electrodes and conducting cords must be especially constructed; the metal within the sponge, if a plate, should be rolled back on itself at its edges so as to present a rounded peripheral contour, or, better still, it should be a ball of about one inch in diameter; the handle of the electrodes should be long, and made of ebonite; the conducting cord should consist of a thick strand of fine wire well insulated by gutta percha. These precautions are necessary, owing to the great "tension" of the current and its consequent disposition to break down insulating barriers which in the case of ordinary currents would suffice to confine them to their proper conductors. Use small Leyden jars.

To use the current (see Figs. 5 and 7), bring the discharg

[1] New York MEDICAL RECORD, May 31, 1890.

ing rods of the Holtz machine into contact, remove the connecting rod which unites the two Leyden jars, and hook on the two conducting cords and electrodes. The patient need not be insulated. If now the wet electrodes be grasped, the machine set in motion and the discharging rods be separated a very small fraction of an inch, the current will be felt and may be graduated to any strength desired or bearable, and may be localized in its application internally or externally in the usual manner. In this connection I quote one of the concluding summaries in my article read in 1881.

"Ninth. The invention, by the author, of a method of obtaining an interrupted static induction current from a frictional electrical machine adds to medical electricity a new and practical means of electrical treatment."

Static Universal Electrode.—This electrode is so named because the administrator may, by a simple motion of the finger in operating the circuit-breaker change his treatment from sparks to current, and vice versa, and because a great variety of terminals may be quickly attached to it, adapting it to the customary forms of application desired for galvanism and faradism. It will be recognized as a great convenience in a single sitting to turn at once from the spark treatment to an agreeable, regulatable, efficient current for use about the face and neck, and wherever else desired to uncover the skin or to introduce, by adding a suitable terminal electrode, within a canal or cavity.

Physical Properties of the Franklinic Interrupted Current.—I have thus far been unable to find any description of this current prior to my own. And medically it is positively certain that it never had been employed. The statement as usually made is as follows:

"Effects of the electric discharge? The recombination of the two electricities which constitute the electrical discharge may be either continuous or sudden; continuous, or of the nature of a current, as when the two conductors of a Holtz machine are joined by a chain or a wire; and sudden, as when the opposite electricities accumulate on the surface of two adjacent conductors, till their mutual attraction is strong enough to overcome the intervening resistances, whatever they may be."[1]

In the one case, the continuous discharge, we have a current physiologically and clinically producing no effects. For, as is well known, we may hold both hands upon the prime conductors of the most powerful Holtz machine and allow the entire current to pass through our bodies without experiencing the slightest electric sensation.

In the other case, the sudden discharge, we have to deal with the disruptive effects seen in the spark from charged conductors and Leyden jars, now so long the common means of medical administrations. The franklinic interrupted current is neither the sudden and transient form (spark or shock) nor the ineffective, continuous flow, but, as has been pointed out, it is a succession of relatively small, sudden discharges, and it produces the permanent effect of physiological tetanus. It therefore stands distinct and by itself as capable of producing a result unattainable by either of the forms mentioned in books. The comparison to the current of an induction coil or of a dynamo is not an exact one, except as to the point of a rapid succession of interruptions. In the induction coil and the dynamo the series is made up of single impulses, or currents in opposite directions. In the Franklinic interrupted each impulse consists of a series of alternating opposite currents of almost inconceivable rapidity. Joseph Henry discovered that each discharge of a Leyden jar was oscillatory in character, not a single transfer of electricity from one side of a jar to another. In making his original statement, he wrote, there is "a principal discharge in one direction, and then several reflex actions backward and forward, each more feeble than the preceding, until the equilibrium is obtained." His discovery was corroborated, and the theory of it worked out by Sir William Thompson, Fedderson, Helmholtz, Schiller, and others. As now stated by eminent physicists, the number of alternations to each spark is from one hundred thousand to one hundred million per second, according to the capacity and inertia of the circuit. Induction coils have been constructed, giving eight thousand vibrations per second; two hundred per second is probably an average of the medical faradic coil. We cannot, therefore, compare the franklinic interrupted current to such coils.

For computing the spark interruption to be at the least two hundred per second, and the oscillations of each spark to be one

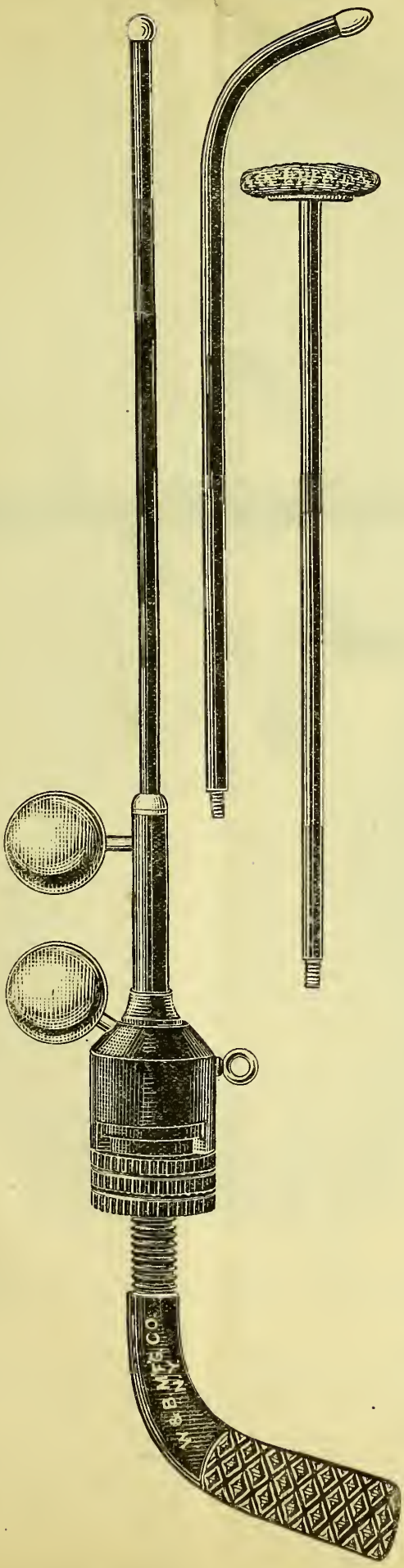

FIG. 10 represents the electrode as now modified and supplied with a variety of attachments, such as sponge, brass ball, throat, urethral, prostatic, rectal, vaginal, uterine, and stomach.

[1] Ganot's Physics, p. 674.

hundred millions per second we have a current giving twenty billions alternations per second. Vast as such a number may seem to our minds, familiar with two hundred vibrations per second, it pales before the desideration expressed by Professor Elihu Thompson, the great authority on the properties of alternating currents, who said in a recent lecture, "What is needed is a machine having an alternating current making five hundred trillions of vibrations per second, which would produce many wonderful results." If, then, I were to be asked how the Franklinic current differs from the ordinary Faradic coil I should reply that this one difference of rate of alternations alone placed the two far apart. But, it may be urged, the current of the induction coil is far greater than that of the influence machine in quantity. This is of course true. But at this point in favor of the Franklinic interrupted comes in the element of time. "The motor nerve," says DuBois Reymond, "is not stimulated by the absolute density of the current density at any given moment, but by variations from one instant to the other,

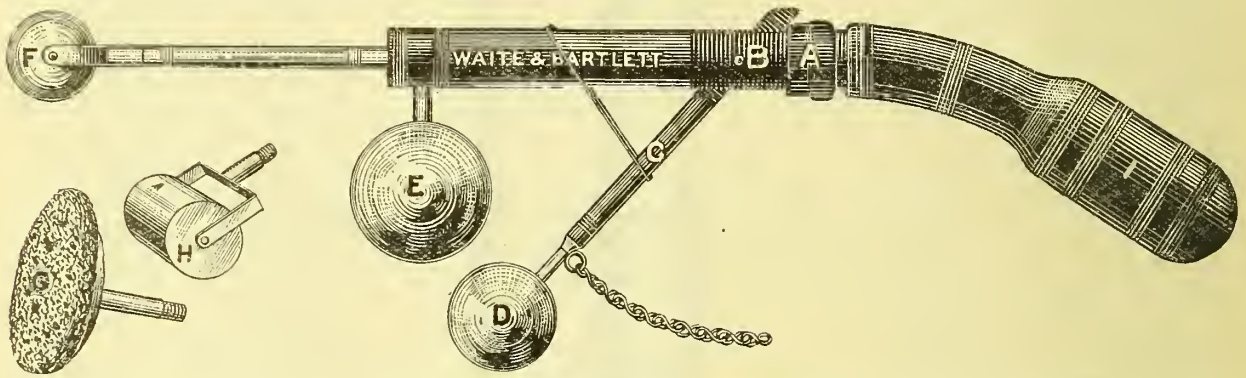

FIG. 11 represents the 1882 modification of the static universal electrode with a number of terminal attachments. From the shape of the handle this was termed by the manufacturers, and in want of a better name, the pistol electrode.

and the effect produced by these rapid changes increases with their rapidity and their greatness in a given time." Thus, in the great rapidity of the alternating (oscillating) currents of the spark discharge, darticularly in rapid series as in the Franklinic interrupted, we find the reason despite smallness in quantity for accomplishing work in producing nerve and muscle stimulation, equal at least to the comparatively slow discharge, of the interrupted galvanic, or the slowly oscillating induction coil. The difference may be compared to a bullet shot from a rifle or the same bullet gently rolled across the floor.

I have at least made it clear, I trust, that the new current is strongly differentiated from the galvanic or faradic currents, and taking into account its enormous voltage or pressure of 53,000 per linear centimetre, viz., its power of overcoming resistance in the human body conductor, and its other characteristics as above pointed out, we have a right to expect in its medical applications physiological effects differing from those of the other electric currents thus far brought into medical use.

Among other purely physical experiments I have made I will mention that it produces a loud and clear sound in a telephone resembling the sounds made by an induction coil.

Clinical Properties and Medical Uses of the Franklinic Interrupted Current.—Since we are dealing with a current and not a spark, and with the familiar sponge or metallic electrodes, we may invade the entire field traversed by galvanism and faradism, and ascertain for ourselves such differences and similarities as may exist.

Applied to a motor point, the Franklinic Interrupted Current produces most vivid and persistent muscular contraction with a minimum of pain; applied farther back on the trunk of a motor nerve it throws large groups of muscles into contraction. The contraction is peculiarly painless as compared with that of faradic coils, and the influence is remarkably diffusive. Accompanying a contraction of a large group of muscles is a peculiar sensory sensation of lightness and buoyancy of the member. The painlessness, diffusiveness, and buoyancy may all be experienced by holding the two electrodes in the hands, and taking a current as strong as possible. Most people will readily submit to flexions successively at the wrists, elbows, and even to the shoulders before insisting upon taking no more. The arms during the passage of the current feel as if made of cork, and this feeling of lightness persists for some time. It is the same feeling doubtless, though here exaggerated, as is commonly referred to as the refreshing effect of general electrization. The quality of the current is such, that while energetically exciting the motor function of the nerve-filaments, it fails to excite or may even annul, to an extent, the sensation of muscular pain. Its penetrating, diffusive, painless effect, with strong muscular contractions, adapt it admirably to general application over the entire body as an electric in place of an ordinary massage.

It is, of course, applicable to every form of muscular paralysis, for there is no practical stimulus to nerve and muscle except the electric, and none more energetic than this form of it.

Its effects upon the Hallerian irritability of the muscular tissue necessarily includes an effect upon the local circulation of a part and upon the lymphatics, and to this may doubtless be referred many clinical results of relief, as in lumbago and all forms of muscular rheumatism, subacute and chronic rheumatic affections of the joints, ovarian or pelvic pain, sciatica or other neuralgias.

The second prominent characteristic of this current is its power of relieving pain. Leaving out of sight the part, be it more or less, played by circulatory changes referred to, in this respect there seems to exist a specific analgesic quality in the current. The cotton feeling in the hands, and subjective sense of buoyancy in the arms, is in itself an evidence of this. But the effect upon pelvic pain, upon ovaritis, upon neuralgias, pleuritic "stitches," tonsillitis, and many other pain affections is still better evidence. In sciatica, for instance, the sensation of pain is frequently quickly relieved and a cure obtained, though I think in this case the cause is twofold, that is to say due to both the circulatory and the analgesic effect. The same I believe to be true in the pelvic and ovarian pains.

The results in such cases, in my opinion, are far superior to anything attainable by a faradic or a galvanic application. An ordinary faradic current will increase the pain, the galvanic will very often relieve it. But we have in the Franklinic interrupted no comparison to the electrotonic and polar effects, or in general the electrolytic effects of the galvanic current. Therefore, when the Franklinic interrupted has failed to act favorably, we should try the galvanic, and vice versa. As no observations on the purely analgesic effects of this current have hitherto been made I must leave others to test the question for themselves. And as the paper is not clinical, but simply to outline the subject in a general way, I can-

not burden it with cases which I might give in large numbers.

The motor effect, including the circulatory, cannot be denied; the pain-annulling effect, though clinically demonstrable, is difficult to explain. Perhaps the extraordinary frequency of the alternations of the current per second may explain it. These alternations, it will be recollected, I computed might easily amount to twenty thousand million per second. My own view is that the

FIG. 12.—Electric Connections and General Method of Administration by Static Universal Electrode. In the cut the wet sponge electrode is applied for example to the facial nerve with characteristic reaction.

great frequency, the fineness, so to speak, of the electric vibrations, which we know as a matter of fact are set up in the nerve-filaments, interferes with and annuls the pain impulse. The carbon filament of a glowing incandescent electric lamp, situated ten feet away from an influence machine discharging sparks, was seen by Dr. H. E. Waite to break. It had evidently been thrown into violent vibration. If it had had a vibration of its own before being subjected to the electric vibration it would have lost it and fallen under the influence of the stronger vibratory influence. Again, a vibrating tuning-fork may lose its motions by reason of the interfering vibrations of another more powerful one and finally vibrate in unison with it. Or electrically a stretched platinum wire may be thrown into visible vibration by the alternating current which at the same time heats it to redness. Medically I venture the suggestion that the nerve-filaments are set into similar vibrations, and that these overcome the pain, not by counter currents, as I understand is the suggestion made by Apostoli, but by simple agitation of the mass of the constituent elements of the nerve-fibre, and thus an annulment of its capacity to conduct pain impulses, just as concussion or anæsthesia of brain-tissue may be said to annul its capacity to respond to sensory impressions. The experiments of Mortimer Granville with his percuteur taught us the benumbing influence upon painful nerves of even coarse vibrations. With alternating electric impulses

of twenty thousand millions per second, more or less, we may find explanation of the analgesic effect of the Franklinic interrupted current. Furthermore, its static quality would enable it to set up an influence in anatomical parts regardless of the intervening medium, as witness the ac-

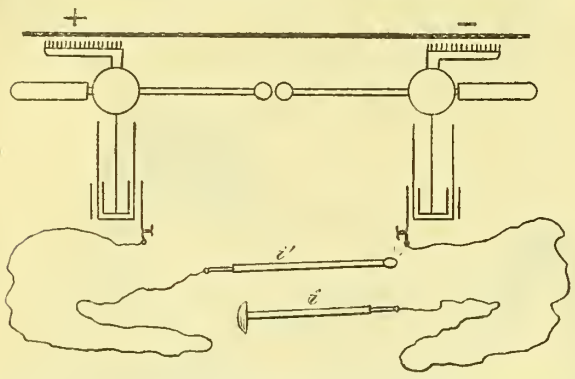

Fig. 13.—Diagram Illustrating Connections for Internal Treatment by the Static Induced Current. i, Indifferent electrode; i^1, uterine or other interior electrode.

tion of the Phelps-Edison induction telegraph, where an inductive circuit sufficient to work a telephone may be set up across an air-space of even forty feet. Surely the analogies of electro-physics are safe guides, and the only safe stand-point from which to study the action of electricity upon the human body.

Another effect upon sensory nerves is the production of a sour taste when the current is applied to the tongue, and of slight waves of light when applied about the eye.

Gynecologically my system of conveying the current within the cavities of the body opens out a wide and promising field of clinical results. To improve the nutrition and remove the pain in and about pelvic organs, in itself covers a large number of conditions of the uterus and its appendages, not yet so thoroughly combated as to allow anyone to say that he can do without an agent so potent to relieve pain and restore local and capillary circulation and set up favorable nutritive changes as the Franklinic current has demonstrated itself to be.

Finally, I may say, as a result of a very considerable experience, that this current penetrates as deeply into the human body as even the galvanic, and I have no doubt that tests may be devised to demonstrate that this is a fact. It will not be one of the unusual retributions when it turns out that static electricity, now frequently referred to as superficial and incapable of affecting the deeper tissues, is accepted as being the most efficacious electric means we possess for reaching those tissues.

I shall be content if my contribution of the Franklinic interrupted, and its wide range of internal and external uses, shall help to place electro-statical in that front rank of electro-therapeutics where I believe it should be.

Dr. Ambrose L. Ranney, to whose able writing the subject of electro-statical therapeutics owes much, very kindly remarks:

"The greatest event, after its discovery, in the history of medical statical electrization or franklinism was the invention of the Holtz or induction machine, in 1865. Next in importance, perhaps, is the method discovered and put into practice by Dr. Morton, in 1880, of converting the static discharge into a dynamic discharge or current; and the electrode represented in the above cut [Fig. 10] is the only novel electrode of any importance

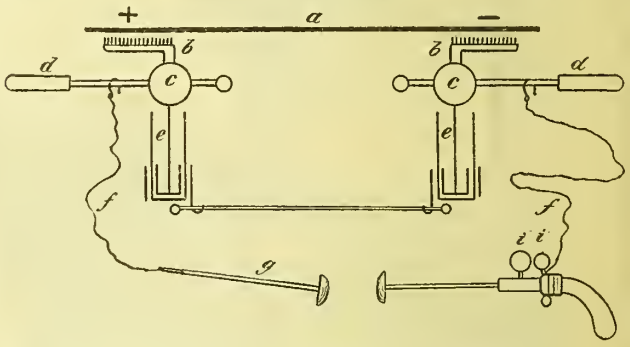

Fig. 14.—Diagram Illustrating Connections for Internal Treatment by the Static Universal Electrode.

not bequeathed to us by the medical electricians previous to 1880."

In conclusion, what is here brought forward as new is:

1. The generalization of what I announced as an isolated fact in 1881, that a regulated interruption in the otherwise inoperative circuit of a Holtz machine would produce in another part of the circuit a current adapted to electro-therapeutic practice. This current I now designate the Franklinic interrupted current. It includes the adaptation of the parts of a Holtz machine to produce this result.

2. A new electrode combining this current with various terminals.

3. The practice of introducing Franklinic electricity in current form into the interior cavities of the human body.

In short, a new system of the therapeutic administration of Franklinic electricity in contradistinction to the system by sparks and its necessary limitations so long in vogue.

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